Journal of Neurosurgery Academy
2025, Vol. 2, No. 1, pp. 7–10
DOI: 10.54646/jna.2025.03
www.bohrpub.com

CASE STUDY

Tuberculum sellae meningiomas

Maximiliano Calatroni[1,2]*

[1]Department of Skull Base and Vascular Neurosurgery, Hospital "San Martin" de La Plata, Buenos Aires, Argentina
[2]Neurosurgery Unit, Hospital Italiano de La Plata, Buenos Aires, Argentina

***Correspondence:**
Maximiliano Calatroni,
drcalatroni@gmail.com

Received: 28 February 2025; **Accepted:** 20 March 2025; **Published:** 29 March 2025

This case report describes a 65-year-old female with tuberculum sellae meningioma presenting with progressive visual impairment. A pterional craniotomy with extradural anterior clinoidectomy enabled tumor resection and optic nerve decompression. Microsurgical techniques achieved gross-total resection without vascular complications. This report highlights the surgical nuances and importance of early optic nerve decompression for skull base neurosurgeons managing complex meningiomas.

Keywords: tuberculum sellae meningiomas, skull base meningioma, video article, intra-tumoral debulking, gross total resection

Introduction

Tuberculum sellae (TS) meningiomas account for 5–10% of all intracranial meningiomas.

The most common presentation is visual disturbance (80%) (1). The TS and the optic complex share an intimate relationship. TS meningiomas compress the optic nerve and chiasm, and invasion is quite common. The origin is usually asymmetric and corresponds to the optic field defect. The other symptoms include seizures, headaches, frontal lobar signs, and other cranial nerve deficits (1, 2).

Case description

We present the case of a 65-year-old female with a previous history of hypertension and breast cancer, treated with surgery and 21 sessions of radiosurgery, who presented to our department due to 3 years of headaches and progressive visual impairment, having started in the right eye. On physical examination, the patient showed functional blindness and normal pupillary function to light tests. No further neurological deficits were identified.

Gadolinium-enhanced magnetic resonance imaging (MRI) demonstrated the presence of a sellar lesion with extension to the suprasellar cistern (33 cm × 30 cm × 25 cm), compressing optic chiasm and the optic nerves, particularly on the right side, with vascular encasement of the ipsilateral internal carotid artery (ICA) (**Figure 1**). CT scan showed a relationship with tubercullum sellae and the presence of calcification within the lesion.

No endocrine abnormalities were detected.

Surgery was addressed on the right side using a standard pterional craniotomy with minipeeling of the middle cranial fossa and extradural anterior clinoidectomy (3) (**Video 1**). This maneuver allows early devascularization and decompression of the optic canal. At the same time, it also gives the possibility of decompression of the optic nerve and proximal vascular control during the intradural stage of surgery (4). Once the dura is open, the splitting of the sylvain fissure is performed from distal to proximal as preferred for the senior author and for accurate localization of the ICA by early identification of its terminal branches. The lesion, as well as the vascular encasement of the ipsilateral ICA and compression of the optic apparatus became evident. Proceeding with microsurgical maneuvers and an ultrasonic aspirator, the lesion was centrally debulked and dissected away from surrounding neurovascular structures. The interoptic, optic-carotid, and carotid-oculomotor triangles were utilized as surgical corridors. Ipsilateral posterior communicating and anterior choroidal arteries were carefully dissected and preserved. The pituitary stalk was identified and preserved within the tumor as it was being resected. The contralateral optic nerve and ICA were released from

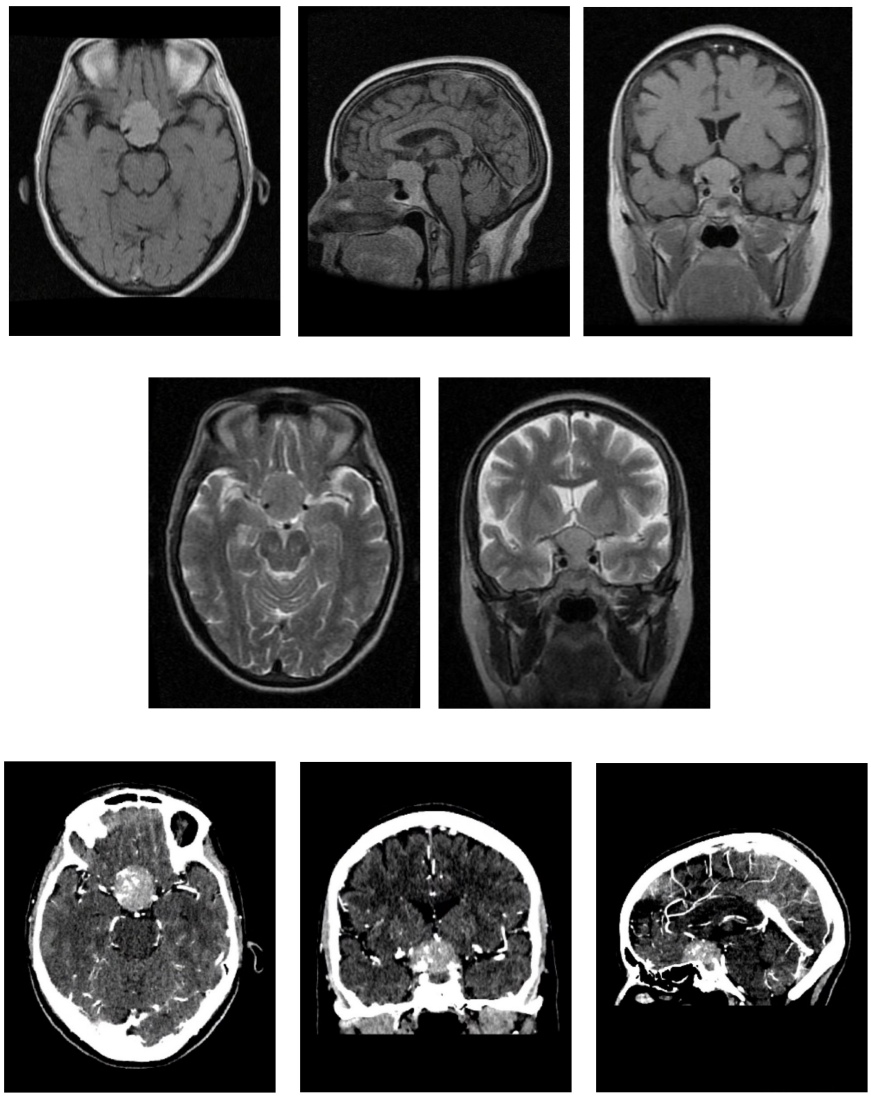

FIGURE 1 | Gadolinium-enhanced MRI shows a sellar lesion with extension to the suprasellar cistern (33 cm × 30 cm × 25 cm), compressing optic chiasm and the optic nerves, particularly on the right side, with vascular encasement of the ICA.

the tumor and remained uninjured. Finally, the lesión was detached from the TS, its implantation coagulated, and the resection was completed.

Transient diabetes insipidus was diagnosed in the immediate postoperative course. No further treatment was needed.

Postoperative contrast-CT scan demonstrates complete resection with preservation of the main vascular supply and no ischemic nor hemorrhagic complications (**Figure 2**).

On postoperative day 6, the patient was discharged home without new neurological deficits or cerebrospinal fluid (CSF) fistula.

Pathology was consistent with World Health Organization grade I meningioma; therefore, postoperative treatment with radiosurgery was discouraged. It was decided to base the follow-up on imaging modalities only.

VIDEO 1 | 0:16-Sylvian dissection; 1:45-Dissection of plane around the tumour using bipolar, micro-scissors and suction; 2:25-ipsilateral optic nerve and internal carotid artery dissected free; 3:18-plane around the ICA dissected free; 4:17-CUSA used to internally debulk tumour; 7:34-meningioma removed en masse; 8:16-hemostasis.
https://youtu.be/R3NEHBkqNNM

At 3 months follow-up, the patient refers no visual improvement. Computerized visual field evaluation remains to be done.

Discussion

TS meningiomas have been traditionally considered together with planum sphenoidale meningiomas as part

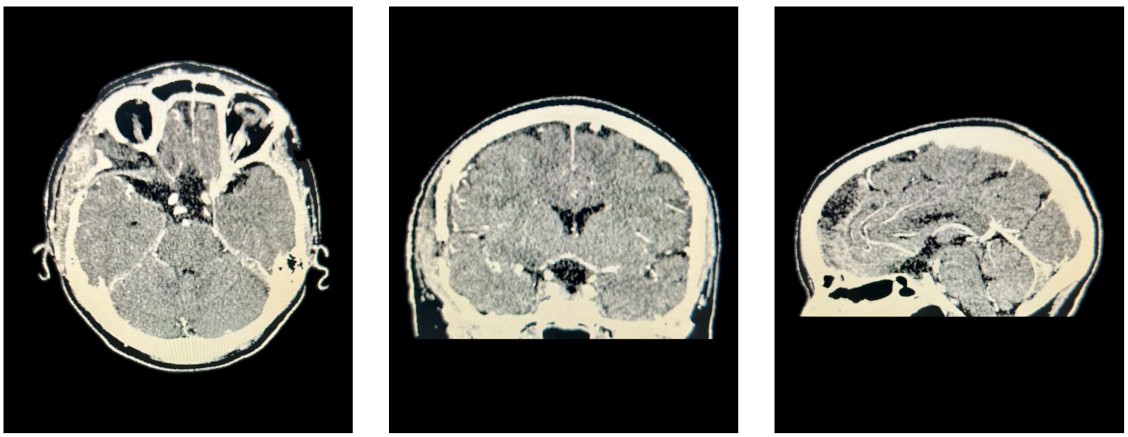

FIGURE 2 | Postoperative contrast-CT scan demonstrates complete resection with preservation of the main vascular supply and no ischemic nor hemorrhagic complications.

of the same group (5). However, true TS meningiomas generally lift the optic complex superiorly, whereas planum sphenoidale meningiomas push them postero-inferiorly. This becomes relevant intra-operatively wherein TS meningioma devascularization involves dissection of branches from the superior hypophyseal arteries (6, 7).

An MRI brain is done with contrast to study the tumor morphology and surgical planning (8). Hayashi et al. (9) recently demonstrated the ability to predict firm adhesions between the tumor and the optic nerve via the fast imaging employing steady state acquisition (FIESTA) sequence, a potential complication for surgery.

Preoperative computed tomography is essential to study bony anatomy and tumor calcifications (10).

Clinical presentation in this case is consistent with the findings in the literature. The majority (60–90%) of patients with this type of tumor present with visual defects at diagnosis (11).

Endocrine abnormalities are found in 8.4% (12). New permanent postoperative impairment of anterior pituitary function is very low (13). Postoperative diabetes insipidus, present in this case, was transient and required no further treatment.

Many transcranial approaches have been described in the past. A unilateral approach yields acceptable results (14). Accordingly, we perform a standard pterional craniotomy on the right side—the side where vision was worse (14).

This strategy combines the benefits of the two main approaching modalities regarding surgical treatment of TS meningiomas: skull base and vascular approaching modalities. The former implies removing bone to prevent brain retraction; the latter relies on early identification of vascular anatomy and proximal vascular control (15).

Some authors reported less satisfying visual outcomes with the pterional-transsylvian route when compared with lateral subfrontal access through a skull base approach (14).

Postoperative visual deterioration or non-improvement is a persistent problem with TS meningiomas. Even though a computerized visual field evaluation remains to be held, the patient presented in this article experienced no improvement in visual function. Considering that we proceed according to the literature that supports clinoidectomy and decompression of the optic nerves when there are tumors involving the optic complex, we believe the lack of improvement may also be related to the time elapsed since the onset of symptoms (16).

When analyzing endoscopic versus transcranial approaches, approaching from below has the advantage of early devascularization with 270-degree visibility and superior hypophyseal and anterior cerebral artery (ACA) preservation. The main disadvantage of the endoscopic endonasal approach (EEA) is CSF leak risk. The other limitations are poor superior and lateral (to optic canal) access, restricted freedom of movement, and low vascular control (17).

Anosmia is a common complication.

De Divitiis et al. (18) described some clear criteria to propose EEA: small or medium-size midline tumors with limited dural attachment and no vascular encasement or calcifications. Fatemi et al. (19) described guidelines for EEA: small midline tumors, no extensive dural involvement, no vascular invasion, and no calcifications. Bowers et al. (20) was similar but suggested to avoid EEA if there is lateral extension beyond carotid arteries even without vascular encasement/invasion.

Schwartz et al. (21) considered lateral extension beyond ICA/encasement/involvement of ACA or optic Magill et al. (22) published the results of two centers, one more experienced in endoscopic approach and the other in transcranial approaches, that failed to show a significant difference in visual outcome between EEA and transcranial approach. They concluded that the surgical approach must always be tailored to each patient based on multiple factors in play.

The rationale underlying the chosen approach is supported by tumor size, extension, optic apparatus involvement,

vascular encasement, and the low incidence of CSF fistula through the transcranial route, according to the available literature (23) presented in this article.

Conclusion

Meningiomas are the most common intracranial extra-axial tumors. TS meningiomas remain a challenge for neurosurgeons due to their relation with vital neurovascular structures. A high level of suspicion is crucial for early diagnosis to assure the most favorable visual outcome and achieve gross total resection. When considering surgical treatment, addressing tumor size, compression/engulfing of the optic apparatus, invasion of the optic canal, and vascular encasement is of outmost importance to decide the most suitable approach. In this regard, the neurosurgeon treating this kind of tumor must have the experience and skills to execute safe and accurate complex skull base and vascular techniques.

References

1. Schick U, Hassler W. Surgical management of tuberculum sellae meningiomas: involvement of the optic canal and visual outcome. *J Neurol Neurosurg Psychiatry.* (2005) 76:977–83. doi: 10.1136/jnnp.2004.039974
2. Turel MK, Tsermoulas G, Yassin-Kassab A, Reddy D, Andrade-Barazarte H, Gonen L, et al. Tuberculum sellae meningiomas: a systematic review of transcranial approaches in the endoscopic era. *J Neurosurg Sci.* (2019) 63:200–15. doi: 10.23736/S0390-5616.16.03912-6
3. Saenz A, Villalonga JF, Solari D, Baldoncini M, Mantese B, Lopez-Elizalde R, et al. Meningo-orbital band detachment: a key step for the extradural exposure of the cavernous sinus and anterior clinoid process. *J Clin Neurosci.* (2020) 81:367–77. doi: 10.1016/j.jocn.2020.09.055
4. Kanjilal S, Das KK, Srivastava AK, Mehrotra A, Bhaisora KS, Jaiswal AK, et al. Extradural anterior clinoidectomy: the "key stone" of clinoidal meningioma resection. *Neurol India.* (2024) 72(1):20–3. doi: 10.4103/neurol-india.Neurol-India-D-23-00687 Epub 2024 Feb 29.
5. Liu Y, Chotai S, Ming C, Jin S, Pan J, Qi S. Characteristics of midline suprasellar meningiomas based on their origin and growth pattern. *Clin Neurol Neurosurg.* (2014) 125:173–81. doi: 10.1016/j.clineuro.2014.08.002
6. Park CK, Jung HW, Yang SY, Seol HJ, Paek SH, Kim DG. Surgically treated tuberculum sellae and diaphragm sellae meningiomas: the importance of short-term visual outcome. *Neurosurg.* (2006) 59:238–43. discussion 238-243.
7. Pamir MN, Ozduman K, Belirgen M, Kilic T, Ozek MM. Outcome determinants of pterional surgery for tuberculum sellae meningiomas. *Acta Neurochir.* (2005) 147:1121–30. doi: 10.1007/s00701-005-0625-0 discussion 1130.
8. Li-Hua C, Ling C, Li-Xu L. Microsurgical management of tuberculum sellae meningiomas by the frontolateral approach: surgical technique and visual outcome. *Clin Neurol Neurosurg.* (2011) 113:39–47. doi: 10.1016/j.clineuro.2010.08.019
9. Hayashi Y, Kita D, Fukui I, Sasagawa Y, Oishi M, Tachibana O, et al. Preoperative evaluation of the interface between tuberculum sellae meningioma and the optic nerves on fast imaging with steady-state acquisition for extended endoscopic endonasal transsphenoidal surgery. *World Neurosurg.* (2017) 103:153–60. doi: 10.1016/j.wneu.2017.03.141
10. Koutourousiou M, Fernandez-Miranda JC, Stefko ST, Wang EW, Snyderman CH, Gardner PA. Endoscopic endonasal surgery for suprasellar meningiomas: experience with 75 patients. *J Neurosurg.* (2014) 120:1326–39. doi: 10.3171/2014.2
11. Karsy M, Raheja A, Eli I, Guan J, Couldwell WT. Clinical outcomes with transcranial resection of the tuberculum sellae meningioma. *World Neurosurg.* (2017) 108:748–55. doi: 10.1016/j.wneu.2017.09.090
12. Komotar RJ, Starke RM, Raper DM, Anand VK, Schwartz TH. Endoscopic endonasal versus open transcranial resection of anterior midline skull base meningiomas. *World Neurosurg.* (2012) 77:713–24. doi: 10.1016/j.wneu.2011.08.025
13. Fujio S, Hirano H, Yamashita M, Usui S, Kinoshita Y, Tominaga A, et al. Preoperative and postoperative pituitary function in patients with tuberculum sellae meningioma-based on pituitary provocation tests. *Neurol Med Chir (Tokyo).* (2017) 57:548–56. doi: 10.2176/nmc.oa.2017-0079
14. Mortazavi MM, Brito, da Silva H, Ferreira M Jr., Barber JK, Pridgeon JS, et al. Planum sphenoidale and tuberculum sellae meningiomas: operative nuances of a modern surgical technique with outcome and proposal of a new classification system. *World Neurosurg.* (2016) 86:270–86. doi: 10.1016/j.wneu.2015.09.043
15. Giammattei L, Messerer M, Belouaer A, Daniel RT. Surgical outcome of tuberculum sellae and planum sphenoidale meningiomas based on Sekhar-Mortazavi tumor classification. *J Neurosurg Sci* (2018). doi: 10.23736/S0390-5616.18.04167-X
16. Nozaki K, Kikuta K, Takagi Y, Mineharu Y, Takahashi JA, Hashimoto N. Effect of early optic canal unroofing on the outcome of visual functions in surgery for meningiomas of the tuberculum sellae and planum sphenoidale. *Neurosurg.* (2008) 62:839–44. doi: 10.1227/01.neu.0000318169.75095.cb discussion 844–836.
17. Soni RS, Patel SK, Husain Q, Dahodwala MQ, Eloy JA, Liu JK. From above or below: the controversy and historical evolution of tuberculum sellae meningioma resection from open to endoscopic skull base approaches. *J Clin Neurosci.* (2014) 21:559–68. doi: 10.1016/j.jocn.2013.03.043
18. de Divitiis E, Esposito F, Cappabianca P, Cavallo LM, de Divitiis O, Esposito I. Endoscopic transnasal resection of anterior cranial fossa meningiomas. *Neurosurg Focus.* (2008) 25:E8. doi: 10.3171/FOC.2008.25.12.E8
19. Fatemi N, Dusick JR, de Paiva Neto MA, Malkasian D, Kelly DF. Endonasal versus supraorbital keyhole removal of craniopharyngiomas and tuberculum sellae meningiomas. *Neurosurg.* (2009) 64:269–84. doi: 10.1227/01.NEU.0000327857.22221.53 discussion 284-266.
20. Bowers CA, Altay T, Couldwell WT. Surgical decision-making strategies in tuberculum sellae meningioma resection. *Neurosurg Focus.* (2011) 30:E1.
21. Khan OH, Anand VK, Schwartz TH. Endoscopic endonasal resection of skull base meningiomas: the significance of a "cortical cuff" and brain edema compared with careful case selection and surgical experience in predicting morbidity and extent of resection. *Neurosurg Focus.* (2014) 37:E7. doi: 10.3171/2014.7.FOCUS14321
22. Magill ST, Morshed RA, Lucas CG, Aghi MK, Theodosopoulos PV, Berger MS, et al. Tuberculum sellae meningiomas: grading scale to assess surgical outcomes using the transcranial versus transsphenoidal approach. *Neurosurg Focus.* (2018) 44:E9. doi: 10.3171/2018.1.FOCUS17753
23. Giammattei L, Starnoni D, Cossu G, Bruneau M, Cavallo LM, Cappabianca P, et al.. Surgical management of tuberculum sellae meningiomas: myths, facts, and controversies. *Acta Neurochir (Wien).* (2020) 162(3):631–40. doi: 10.1007/s00701-019-04114-w